

Myotis austroriparius. By Clyde Jones and Richard W. Manning

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Myotis austroriparius (Rhoads, 1897)

Southeastern Myotis

Vespertilio lucifugus austroriparius Rhoads, 1897:227. Type locality "Tarpon Springs, Pinellas County, Florida."

Myotis austroriparius: Miller and G. M. Allen, 1928:76. First use of current name combination.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae. *Myotis austroriparius* is now considered to be monotypic (LaVal, 1970), so that *M. a. gatesi* Lowery and *M. a. mumfordi* Rice are synonyms of *M. austroriparius*.

DIAGNOSIS. No prominent keel on calcar. Toes with long hairs, extending beyond the tips of the claws. Pelage somewhat woolly in appearance (Fig. 1), with little or no contrast between the base and the tip of the hairs (Barbour and Davis, 1969; Hall, 1981; LaVal, 1970). The baculum is small and differs from those of closely related forms (Davis and Rippy, 1968; Rippy, 1965). Greatest length of the skull usually <15 mm, skull with abruptly rising forehead, braincase highly inflated, sagittal crest usually present (Fig. 2).

GENERAL CHARACTERS. The dental formula is $i\ 2/3$, $c\ 1/1$, $p\ 3/3$, $m\ 3/3$, total 38. External measurements (in mm), range in parentheses, of 18 males are: total length, 83.7 (77.0 to 89.0); length of tail, 36.8 (26.0 to 44.0); length of foot, 9.5 (7.0 to 11.0); length of ear, 12.0 (11.0 to 16.0); length of forearm, 36.0 (33.0 to 39.0). Weight of nine males averaged 5.9 (5.1 to 6.8) g. External measurements (in mm) of 29 females are: total length, 87.2 (80.0 to 97.0); length of tail, 38.0 (29.0 to 42.0); length of foot, 10.0 (8.0 to 12.0); length of ear, 13.3 (9.0 to 15.0); length of forearm, 38.6 (33.5 to 40.0). Weight of 19 females averaged 6.9 (5.2 to 8.1) g (Lowery, 1974). Cranial measurement (in mm) of >100 males and females averaged, respectively, as follows: length of skull, 14.46 (13.7 to 15.2), 14.56 (13.5 to 15.2); depth of occipital, 6.65 (6.1 to 7.2), 6.70 (6.1 to 7.2; LaVal, 1970). Pelage varies from gray to bright orange-brown, females generally are more brightly colored than males (Hall, 1981; LaVal, 1970).

DISTRIBUTION. The geographic range of this species (Fig. 3) includes southern Illinois and Indiana in the north, westward into southeastern Oklahoma and northeastern Texas, and eastward to the southern part of North Carolina and the northern one-half of the peninsula of Florida (Hall, 1981).

FOSSIL RECORD. Pleistocene occurrences include Reddick, Devil's Den, Arredondo, Vero, Kendrick, and Coleman IIA, all in Florida. The stratigraphic range is from Late Irvingtonian (Coleman IIA) to Recent (Kurtén and Anderson, 1980; Webb, 1974).

FORM AND FUNCTION. In the northern parts of its geographic distribution *M. austroriparius* may hibernate for as long as 7 months, that is, from September or October to February or March. However, in the southern portions of its distribution, this species remains active throughout much of the winter, actively feeding most of the time. During periods of hibernation, *M. austroriparius* has been found in compact clusters (up to 50 individuals) hanging from the ceilings and side walls of caves or beneath buildings (Jones and Pagels, 1968; Lowery, 1974; Mumford and Whitaker, 1982). In Louisiana, Lowery (1974) found that these bats went into a semitorpid condition when the temperature dropped below 40°F, but when warm temperatures returned the bats awakened and resumed their nightly foraging activities. Jones and Pagels (1968) found *M. austroriparius* torpid only on a few occasions.

ONTOGENY AND REPRODUCTION. Details concerning reproduction in this species are poorly known. Rice (1957) thought that both yearling males and females were reproductively

active in Florida in the spring. Although they reported animals from each month of the year, Mumford and Whitaker (1982) and Lowery (1974) had no direct evidence that *M. austroriparius* breeds in Indiana and Louisiana, respectively. In Florida, Rice (1957) found that nearly all males had enlarged epididymides from about 12 February to 16 April. Mumford and Whitaker (1982) reported males from Indiana with scrotal testes in March, April, and August; those with the largest testes, however, were taken in August. In *M. austroriparius*, each testis descends to an obvious position on either side of the base of the tail.

Two newborn *M. austroriparius* had a weight of 1.10 and 1.15 g, respectively (Sherman, 1930); weight of the mother was 7.25 g. Measurements of length of forearm of six neonates with umbilical cords attached ranged from 8.7 to 10.4 mm (Foster et al., 1978). These authors observed that all deciduous teeth had erupted at birth, the first permanent teeth to emerge were i_1 , i_2 , and i_3 , and all permanent teeth were erupted in individuals with forearms >28 mm in length. Young bats take flight about 5 to 6 weeks after birth (Rice, 1957).

Sherman (1930) recorded the following observations about parturition in *M. austroriparius*. Females with widely spread feet and thumbs, hung with wings slightly spread, and the tail was curled, forming a pocket with the interfemoral membrane. Birth was by breech presentation, during which the amnion was torn and the umbilical cord bitten in two by the mother. The young crawled about



FIG. 1. Photograph of *Myotis austroriparius*. Photograph courtesy of R. W. Barbour and J. K. Jones, Jr.



FIG. 2. Dorsal, ventral, and lateral view of cranium and lateral view of mandible of *Myotis austroriparius* (Texas Tech University 36100, male, 2 mi S Smithville, Lawrence County, Arkansas). Greatest length of skull = 14.75 mm.

in the interfemoral membrane until they found their way to the nipples. Sometimes the female helped push the young toward the nipples. Neonates were licked rather constantly by the female. When the placenta appeared, it was pulled out and eaten by the mother.

At birth, the young bats are naked except for a few vibrissae and some scattered hairs on the toes and in the region of the knees. The skin is rather transparent and has a pinkish hue. The eyes and ears (blackish in color) are closed. Tips of the ears unfold and stand erect when the animals are 1 or 2 days old (Sherman, 1930).

In Florida, parturition in this species occurs from late April to the end of May, with the peak of births in the second week of May (Rice, 1957). Young bats were found as early as 30 April; no pregnant females were detected after 17 May in colonies that were studied. A total of 90% of the pregnant females give birth to twins; the remainder of the females produce one young. *M. austroriparius* is unique among the members of this genus in the United States in

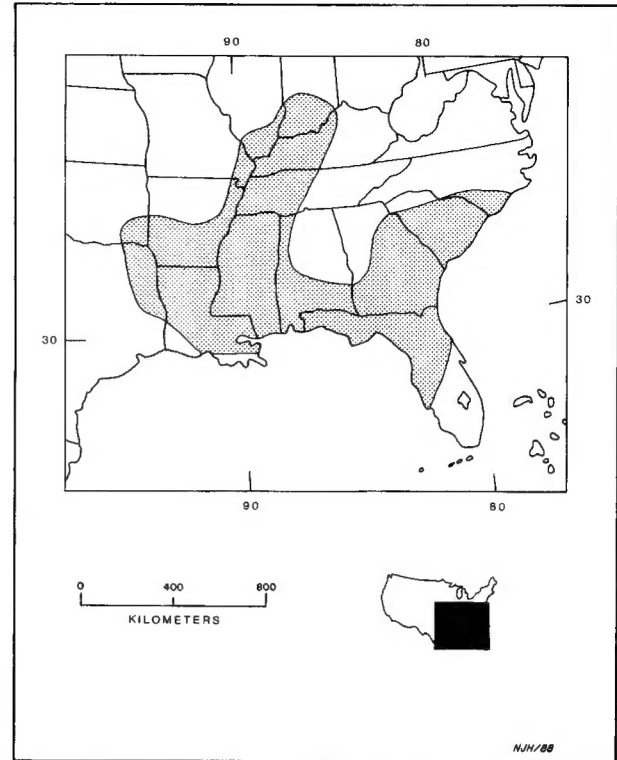


FIG. 3. Geographic distribution of *Myotis austroriparius* in the southeastern United States.

that all other forms normally produce one young (Barbour and Davis, 1969). One female containing three full-term fetuses with forearms measuring from 9.2 to 10.4 mm in length has been reported (Foster et al., 1978).

ECOLOGY. Maternity colonies are formed during late March and early April in the caves of central Florida. Rice (1957) found few males in nursery colonies; however, many adult males joined the colonies after maturation of the young. Bats in these colonies disperse during October; males depart earlier than females.

In his studies of populations of *M. austroriparius* in Florida, Rice (1957) found that only 42% were males; because the ratio of sexes at birth is 1:1, he suspected higher mortality among the males. Tabulation of sex ratios (Mumford and Whitaker, 1982) in several colonies of these bats in Indiana revealed a predominance of males (56.3 to 77.4% males).

Occasionally *M. austroriparius* has been found associated with groups of *M. lucifugus* (Mumford and Whitaker, 1982). Sherman (1937) found a few southeastern myotis in a large colony of *Tadarida brasiliensis cynocephala* in Florida. *M. austroriparius* has been found utilizing the same caves as *Pipistrellus subflavus* during the winter in Florida (Rice, 1957). In Louisiana, this species shared roosting sites with *P. subflavus* and *Plecotus rafinesquii* during most months of the year (Jones and Suttus, 1973, 1975).

In Illinois, Florida, Kentucky, Tennessee, and Mississippi, caves are the most frequently selected roosting sites, although other shelters occasionally are used (Barbour and Davis, 1969). Except for one female found in a breeding colony of *M. lucifugus* in the attic of a building, all Indiana records of the southeastern myotis are from caves (Mumford and Whitaker, 1982). These bats roost in hollow trees and buildings in caveless Louisiana (Lowery, 1974). Since its range is mostly outside of the cave regions of Arkansas, this species resides mainly in old mine shafts, buildings, and hollow trees there (Sealander, 1979).

Two clusters of *M. austroriparius* observed in caves in Indiana were in dry portions of the caves (no water present below them) and one cluster was in a cave that was completely dry. One colony of these bats was found over a gravel bar at the edge of the stream in a cave (Mumford and Whitaker, 1982). In Florida, colonies of *M. austroriparius* were found over pools of water in caves (Rice, 1957). Foster et al. (1978) thought that water was an important deterrent

to predation, as well as the major factor responsible for maintenance of high humidity so necessary for the clusters of bats; however, roosting over water resulted in a higher rate of mortality for young bats that became dislodged and fell from the roost.

This bat is usually associated with ecological communities near water. Animals emerge from roosting places late in the evening and fly to nearby ponds and streams to feed (Barbour and Davis, 1969). Mumford and Whitaker (1982) found that southeastern myotis consistently emerged from roosts later in the evening than *M. lucifugus* in Indiana. While feeding, *M. austroriparius* usually flies close to the surface of the water (Barbour and Davis, 1969; Lowery, 1974).

These bats occupy different roosts during summer and winter in Florida, but the patterns of movements between sites are unknown. Movements of banded animals were recorded for distances of 28.9 to 72.4 km (Rice, 1957). Mumford and Whitaker (1982) found no evidence of migration of this species in Indiana, but animals move into and out of hibernating sites periodically.

Rice (1957) found southeastern myotis from Florida to be heavily infested with mites (*Spinturnix* sp., *Ichoronyssus quadridentatus*) and parasitic flies (*Basilia boardmani*, *Trichobius major*). Mumford and Whitaker (1982) reported mites (*Olabidocarpus whitakeri*), chiggers (*Euschongastia pipistrelli*), and some unidentified intestinal trematodes from bats in Indiana.

Predators known to eat *M. austroriparius* include the Virginia opossum (*Didelphis virginiana*), cockroaches (*Periplaneta americana*, *P. australasiae*), rat snakes (*Elaphe obsoleta*), and corn snakes (*E. guttata*). Owls also are known to prey on these bats (Lowery, 1974; Mumford and Whitaker, 1982). By the destruction of roosting sites and killing of animals, man is probably the major threat to the species.

GENETICS. There are 17 pairs of acrocentric and 4 pairs of metacentric chromosomes in *M. austroriparius*. The X and Y chromosomes are submetacentric. The diploid number is 44; the fundamental number is 50 (Baker and Patton, 1967). To our knowledge, no idiogram for *M. austroriparius* has been published.

REMARKS. The generic name is from two Greek words, *mys*, meaning mouse, and *otis*, meaning ear (Jaeger, 1955). The specific name is from two Latin words, *austro*, meaning southern, and *riparius*, which means frequenting edges of streams. Southeastern myotis is the accepted vernacular name for this species (Jones et al., 1986).

S. Clemmer and M. Candee helped us locate some of the literature. The photographs of the skull were taken by N. Olson. N. Hildreth constructed the map. S. Burgeson typed numerous versions of the manuscript.

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